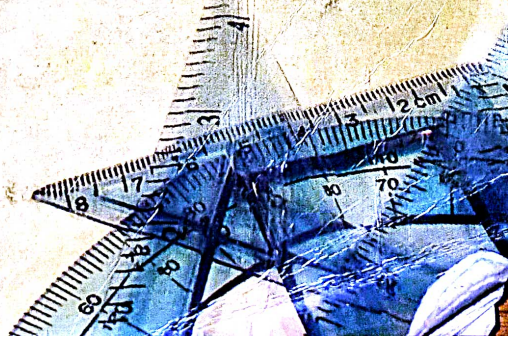
Commercial Arithmetic

F.Y. B.Com. Semester-I

Dr. Neeta Mazumdar
Dr. Chandrakant Phadte

SSDC, GOA
511 MAZ/COM
BC27829

SP SHETH®
PUBLISHERS PVT. LTD.



27824

Prepared as per the new syllabus of Goa University effective from academic year 2017-18.

COMMERCIAL ARITHMETIC

F.Y. B.COM. (SEMESTER – I)

DR. NEETA MAZUMDAR
M.Sc., M.Phil., M.P.S. Ph.D.
Department of Mathematics & Statistics,
S.S. Dempo College of Commerce & Economics,
Cujira, St. Cruz – Goa.

DR. CHANDRAKANT PHADTE
M.Sc., M.Phil., Ph.D.
Department of Mathematics & Statistics,
G.V.M.'s College of Commerce & Economics,
Farmagudi, Ponda – Goa.

FIRST EDITION

When you care enough to be better than the best

SP® SHETH®
PUBLISHERS PVT. LTD.
MUMBAI
PUNE ☆ GOA ☆ NAGPUR ☆ VADODARA ☆ BHAVNAGAR
Follow us: /shethpublishers /sheth.publishers

Sheth Publishers Private Limited

Our Foot Prints

Regd. Office & Show Room	:	Unit No. 4, Ground Floor, Lalwani Industrial Estate, 14, G.D. Ambekar Marg, Wadala, Mumbai – 400 031. ✆ (022) 6662 4553 / 6662 4554 FAX : 6662 4556 Email : support@shethpublishers.com
Goa	:	'PALLAV–KUNJ', Borda, Margao, Goa, ✆ (0832) 2733436
Pune	:	302, Mahalaxmi Chambers, 3rd Floor, Appa Balwant Chowk, 23, Budhwar Peth, Pune–411 002. ✆ (020) 24450773
Nagpur	:	Shreeniwas Apt., Mukundraj Lane, Opp. Dharampeth Mahila Bank, Walker Road, Mahal, Nagpur – 440 002. ✆ (0712) 2737052
Vadodara	:	Joshi Brother's Krishna Krupa Miradatar's Tekro, Navabazar, Vadodara – 390001 (Gujarat). ✆ 0265-2418911 / 2411287
Bhavnagar	:	Shah & Co. High Court Road, Bhavnagar (Gujarat). ✆ (0278) 2516679

Price : ₹ 80/- only

27829

ISBN - 978-93-87778-92-4

DEMPO COLLEGE OF COMMERCE & ECONOMICS
LIBRARY
Cujira Integrated Educational Complex

© Authors

The book is strictly written according to the new syllabus available at the time of printing.

Every possible effort has been made to avoid errors and omissions in this publication by the Authors and the Publishers. Inspite of this effort, some typographical errors might have crept in. Any mistake, error or discrepancy noted may be brought to our notice which shall be taken care of in the forthcoming edition. It is hereby notified that neither the Author nor the Publishers or seller will be liable for any damage or loss to anyone, in any manner, there from. It is suggested that to avoid any doubt the reader should cross–check all the facts, law and contents of the publication with original Government publication or notifications wherever applicable.

The text of this publication, or any part thereof, may not be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, storage in an information retrieval system, or reproduced on any disc, tape, perforated media or other information storage device, etc., otherwise, without the prior written permission of the publisher and author. No key to this book can be prepared without the prior written permission of the Publishers. Any violation will invite prosecution legal action under the Indian Copyright Act.

This book is sold subject to the condition that it shall not by way of trade or otherwise, be lent, resold, hired out or circulated.

For binding mistakes, misprints or for missing pages, etc., the publishers' liability is limited to replacement within one month of purchase by similar edition. All expenses in this connection are to be borne by the purchaser.

All disputes are subject to jurisdiction of courts, tribunals and forums at Mumbai only.

Published & Printed by : Sheth Publishers Private Ltd., Unit No. 4, Ground Floor, Lalwani Industrial Estate, 14, G.D. Ambekar Marg, Wadala, Mumbai – 400 031. ✆ 6662 4553 / 6662 4554 FAX : 6662 4556.

CONTENTS

1.	**MATHEMATICAL LOGIC**	**1 - 10**
1.1	Introduction	1
1.2	Logical statement and their truth values	1
1.3	Truth values and truth tables	1
1.4	Connectives, Compound statement	1
1.5	Equivalence of two statement	6
1.6	Tautology and Contradiction	7
1.7	Argument in Logic	7
	Solved Examples	8
	Exercises	8
2.	**SET THEORY**	**11 - 19**
2.1	Introduction	11
2.2	Set	11
2.3	Representation of Set	11
2.4	Type of Sets	12
2.5	Venn Diagram	12
2.6	Operation on Sets	13
2.7	De Morgan's Laws	14
	Solved Examples	14
	Exercises	18
3.	**PERMUTATION AND COMBINATION**	**20 - 33**
3.1	Introduction	20
3.2	Fundamental Principle	20
3.3	Permutation	21
3.4	Permutation with Repetitions	27
	Exercises	27
3.5	Combination	28
	Solved Examples	29
	Exercises	32
4.	**PROGRESSIONS**	**34 - 49**
4.1	Introduction	34
4.2	Arithmetic Progression	34
4.3	nth term of an A.P.	35
4.4	Sum of n terms of an A.P.	36
4.5	Business Applications of A.P.	39
	Exercises	41
4.6	Geometric Progression	42
4.7	nth term and the sum of n terms of G.P.	42
4.8	Business Applications of G.P.	45
	Solved Examples	45

4.9 Examples on Appreciation and Depreciation of Commodities 47
Solved Examples 47
Exercises 48
5. MATHEMATICS OF FINANCE 50 - 66
5.1 Simple Interest 50
5.2 Compound Interest 50
Solved Examples 51
Exercises 55
5.3 Nominal and Effective Rate of Interest 56
5.4 Present and Future Value 56
Solved Examples 57
5.5 Annuity 57
5.6 Ordinary Annuity 58
Solved Examples 60
5.7 Sinking Fund 61
5.8 Present value of an Annuity 62
Solved Examples 63
Exercises 64
5.9 EMI using interest on reducing balance and flat interest 65
Exercises 66
6. DETERMINANTS 67 - 75
6.1 Meaning and Definition 67
6.2 Determinant of Order 2 67
6.3 Minor of a Determinant 67
6.4 Co-factor of a Determinant 67
6.5 Determinant of Order Three 68
6.6 Cramer's Rule 68
6.7 Consistency of Linear Equations 68
Solved Examples 69
Exercises 74
7. MATRIX 76 - 87
7.1 Introduction 76
7.2 Matrix : Basic Concepts 76
7.3 Type of Matrices 76
7.4 Operations on Matrix 79
Solved Examples 80
7.5 Business Application of Matrix 84
Exercises 85

1 Mathematical Logic

1.1. Introduction

George Boole (1816-1864) invented symbolic logic. One of the main aim of logic to provide rules by which one can determine whether any particular argument or reasoning is valid. Any collection of rules needs a language in which these rules or theory can be stated. The language is called **object language.** In fact, every scientific discipline developes its own object language which consisits of certain well defined terms and well specified uses of these terms.

The difference between logic and other disciplines is that in other disciplines we are concerned with the use of object language while in logic we are as interested in analysing our object language as we are using it.

Logical reasoning for example, is applied by a software engineer to verify the correctness of programs, by scientist to draw conclusion from experiments and so on.

1.2. Logical statement and their truth values

A simple, declarative sentence which is either 'True' or 'False' but not both at the same time is called a **statement or Proposition** is logic.

Example :

1. Goa is a state.
2. $5 + 4 = 9$
3. Pune is capital of India.
4. Sum of two even integers is odd integer.

All the above sentences are statements. The first two are true statement while the last two are false statements.

Note that the following sentences are not statements.

5. 2x is a natural number.
6. In which college are you studying ?
7. She is very pretty.

Sentence 5 is not a statement as 'x' is not described there, sentence 6 is not declarative at all while in statement 7 we do not know who is she.

The above given examples from 1 to 4 are statements in logic which can be denoted by letters p, q, r, s, etc.

Two or more simple statements are combined by means of logical operator to form a compound statement.